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Optical fibre feed arrangement

TECHNICAL FIELD OF THE INVENTION

The present invention concerns a method to be used for feeding at adjustable speed of an optical fibre cable into a pipeline/duct, and an arrangement devised for adjustable feeding of an optical fibre cable into the same. The feeding arrangement and method are primarily intended to be used for installations of optical fibre cables in pipeline systems located outdoors or between residential units and a central unit, such as between several apartments in an apartment building and a central coupling unit located in the house's cellar or similar.

DESCRIPTION OF RELATED ART

It has been known for some time that optical fibres or optical fibre cables can be blown or sucked into pipelines/ducts, either by creating overpressure by means of compressed air supply so that the optical fibre or optical fibre cable is blown into the pipeline, or by creating under-pressure at the end of the pipeline/duct, so that the optical fibre or the optical fibre cable is sucked into it.

SUMMARY OF THE INVENTION

In order to simplify the handling of optical fibre cables in connection with their feed into pipelines/ducts and to ensure that they are not exposed to undesirable pressure during the feeding process, which could result in the bending or breaking of the cables during this process, a feeding device located in the feeding mechanism has been

supplied with a friction safety clutch which regulates the feed of the optical fibre cable when feed resistance increases. For additional regulation of the advancement of the optical fibre cable the feeding mechanism can be regulated by adjusting the air stream and/or the rotation speed of the feeding wheel. To further facilitate the operation of the feeding arrangement it has been designed as a hand-tool which needs to be connected to just one or more energy sources.

The invention is described below in more detail with the help of a proposed method of execution and with reference to the enclosed pages containing drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

Figures 1 - 3 show different views of the feeding device in accordance with the invention.

Figure 4 shows the feeding device in perspective.

Figure 5 shows the feeding device when disassembled.

Figures 4 and 5 provide details of how friction safety clutches can be arranged in relation to the feeding device.

DETAILED DESCRIPTION OF EMBODIMENTS

Figures 1 - 5 show how a feeding device can be constructed in accordance with the invention. The feeding

device consists of a handgrip unit 1 containing a battery 2 and of a feeding system for optical fibre cables. The feeding arrangement consists in turn of a lower part 3 and an upper part 4 connected with each other by a guide bar 5 which is further equipped with an adjustable positioning screw 6. With the help of the positioning screw 6 the distance between the upper part and the lower part can be regulated, so that the optical fibre cable can be placed correctly between the upper and the lower part when open, and when the two parts are brought together it will find itself in a groove 7 between the upper part and the lower part. The cross-section of the groove has been designed in such a way as to be able to hold a maximum of the cross-sectional area of the optical fibre cable. At the front of the upper and lower parts removable extension units 8, 9 of suitable material have been fastened, which form together a hollow space 10 of a circular cross-section, for example, into which the end of a pipeline/duct can be entered, and through which the optical fibre cable is fed. Adjacent to the removable extension units is a space 11 for compressed air to be supplied for feeding the optical fibre cable into the pipeline. The lower section of this space is connected to a compressor 12 by means of an adjustment screw 13 for regulation of the supply of compressed air. The lower section is further connected to a handgrip unit 1 which can be designed like a pistol-type handle, containing a trigger 14 for the regulation of the number of revolutions of the engine 15 pushing the optical fibre cable forward. In addition to the regulator of the rotational frequency the section

also contains a switch for changing the direction of the feed and a resetting device. The engine 15 is fastened to the lower part, and its driving axle 16 operates through a friction safety clutch 17 upon a moving coil 18. The engine can be either electrically driven or it may be powered by compressed air. Electric operation can be provided by means of a rechargeable battery in the battery component 2 fastened to the handgrip's lower part 1, or it may be connected to an external power supply via the rotational frequency regulator. When using the electric engine only, the optical fibre cable can be fed into the pipeline without any supply of compressed air to the extension units. When the engine is operated by compressed air, its compressor can be connected to the compressor used for the feeding of the optical fibre into the pipeline. The friction safety clutch 17 ensures controlled forward feed of the optical fibre cable due to the fact that at constant rotation of the engine and increased resistance felt by the optical fibre cable during its forward feed into the pipeline the moving coil will skid in the opposite direction to the driving axle, preventing the cable from being exposed to forces going in the opposite direction, which could result in the bending or breaking of the optical fibre cable in the feed area. By further providing the clutch with a possibility of regulation, a suitable safety level can be achieved for the forward feed of the optical fibre cable. Thanks to the flexibility provided by the friction safety clutch, the force of the forward motion of the optical fibre cable can be regulated, depending on the resistance encountered in the pipeline, and the forward feed of the cable can thus be optimised.

The friction safety clutch 17 may consist of two circular contact surfaces 19, 20 made of low-friction material, operating between the end of the driving axle 16 and the moving coil 18 made of metal, as well as between the said moving coil and an external plate (21), which is connected to the driving axle's end by means of adjustment screws 22 (see Figure 6). The contact surfaces can thus be pressed against the moving coil with controlled force. If the feed of the optical fibre cable is obstructed in the pipeline, the contact surfaces of the friction safety clutch will start skidding against the moving coil, impeding its movement, so that the cable will not be pushed forward at the risk of being damaged. The friction safety clutch 17 may also consist of a moving coil 23 made of low-friction material, operating between the driving axle's end 16 and an external, spring-loaded 24 plate 25 made of, for example, metal. The force exerted by the spring can be regulated by means of a screw 26 in order to attain a desirable degree of friction by the clutch, thus preventing damage of the optical fibre cable during its forward feed into the pipeline.

The upper part contains further a spool holding device 27, 28 with a spool support 29 on which a spool with an optical fibre cable can be fastened. The holding device for the spool arm has been designed in such a way that the position of the spool arm can be adjusted as desired. The upper part contains also a revolution counter 30. With the help of the rev. counter the number of revolutions may be counted, or the length of

the optical fibre cable fed into the pipeline measured by means of a measuring wheel 31 which is turned by the running optical fibre cable being fed into the pipeline. The measuring wheel can be spring-loaded, so that the pressure of the optical fibre cable which is being fed into the pipeline can be regulated, which helps to ensure that the cable advances correctly. The measuring wheel should preferably be made conspicuous and contain some sort of marking, so that the wheel's rotations can be observed, which is of great use to the user of the installation device. This can be done by providing a transparent lock 32 for the measuring wheel, ensuring its protection and visibility of its rotations. The user will thus be able to see whether the measuring wheel is rotating or not during the forward feed of the optical fibre cable by the moving coil, which is why it is a good idea to provide also the moving coil with some visible marking so that its rotations can be observed. This can be done by supplying a transparent lock 33 for the moving coil so that it can be protected and visible.

The installation device may either be held by hand or it may be placed on a tripod. A roll of optical fibre cable is placed on the spool arm and one end of the cable is introduced into the groove space between the upper and the lower part. To regulate the distance between the upper and the lower part a positioning screw is used for the raising or lowering of the upper part in relation to the lower part. When the two parts are brought together the measuring wheel will press the optical fibre towards the moving coil with the help of the spring. The optical

fibre cable is further led through the interacting removable extension units, and its one end is stuck into a pipeline which has been placed in the extension units. When the engine is started and compressed air is supplied, the optical fibre cable will be fed into the pipeline. Depending on the feed requirements the positioning screws are adjusted in a suitable way, and an operator may monitor the feed.

When a tripod is used, the installation device can be manoeuvred from a distance with a remote control 34. Once suitable air supply and a desirable degree of friction has been ensured with the help of the adjustment screws, the installation device placed on a tripod may easily be manoeuvred by means of the remote control, and the operator has more time to watch over and regulate the forward feed of the cables. The invention is, naturally, not limited to the above-described method of execution illustrated in the drawings, and can be modified within the framework of the attached patent claims.